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Sleep Disorders among Professional Oil Tanker Drivers in Ouagadougou Burkina Faso

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Abstract

Introduction: Sleep disorders among professional drivers are a major road safety problem. They cause fatigue and drowsiness at the wheel, which can lead to road traffic accidents and even accidents at work. The aim of this study was to assess sleep disorders among professional drivers of oil tankers in Ouagadougou, Burkina Faso. **Methods:** This was a descriptive and analytical cross-sectional study carried out from 11 April 2020 to 11 September 2020 in the national hydrocarbon company's fuel depot. All the drivers present at the time were included and accomplished a questionnaire incorporating the commonly scales using to assess sleep disorders, sleep quality and sleep apnoea. Data analysis using R 3.6.1 software enabled to perform univariate and multivariate analyses to identify associated factors. Adjusted odd ratios were used to measure the strength of association. The significance level chosen was $p \leq 0.05$. **Results:** All the 339 respondents were male. A proportion of 33.6% suffered from insomnia, including 12.7% with moderate to severe insomnia, and 18.58% were at risk of sleep apnoea. On the Epworth scale, 26.6% of drivers showed sleep debt and 4.1% excessive daytime sleepiness. The risk factors associated with insomnia were the use of psychostimulants. A history of diabetes and insomnia were risk factors associated with sleep apnoea syndrome. **Conclusion:** The prevalence of sleep disturbance and insomnia among the respondents were 52.2% and 33.6% respectively. Use of psychostimulants was the identified risk factor. The prevalence of SAS was 4.72%, with diabetes and insomnia as associated factors.

Keywords

Sleep Disorders, Sleep Apnoea, Occupational Health, Burkina

1. Introduction

Safety has become a major issue in the transport sector, as it has particularly remarkable implications in terms of social, economic and safety costs such as the loss of human life or productive capacity, destruction of equipment and infrastructure. Road accidents are one of the main causes of death and disability globally. In fact, the number of deaths due to road accidents remains unacceptably high, with an estimate of 1.35 million deaths every year and with an increased risk: three times higher risk in low-income countries than in high-income countries [1]. Public health studies have reported that drowsiness while driving and the associated risk of falling asleep are the reasons for 5% - 30% of the total road accidents, depending on the driver and/or the road network used [2]. Such commuting accidents are the leading cause of fatal accidents among drivers [3]. In the United States in 2015, driver fatigue was the main reason for 415,000 accidents involving large trucks, resulting in the death of 3589 people [4]. In France, drowsiness while driving was the main reason for 20% of the total road accidents [5]. Sleep-related problems are therefore the known risk factors for road accidents. Sleep apnoea and drowsiness while driving are the major factors for road accidents among professional heavy goods vehicle (HGV) drivers in Casablanca [6], consistent with the finding of a study of truck drivers in Mali [7]. In Burkina Faso (BF), traffic accidents have become an important public health problem. The number of accidents recorded throughout the country increased from 20,578 to 20,871 during 2019-2020, resulting in 1060 deaths [8]. Currently, data on sleep disorders prevailing among professional drivers in BF are limited. The SOciété NAtionale Burkinabe d'HYdrocarbures (SONABHY) is exclusively responsible for importing and distributing oil throughout the country, and 2067 tanker drivers were under contract in 2020. The present study investigated the risks of sleep disorders and associated factors among professional drivers of oil tankers in BF.

2. Materials and Methods

2.1. Study Population

This descriptive and analytical cross-sectional study was conducted from 11 April 2020 to 11 September 2020. The study population consisted of professional drivers of oil tankers in BF.

Drivers with at least 1 years' service, who were available at the time of the survey and provided informed consent were included as the study population. The exclusion criteria concerned drivers who were absent during the study period, or who were absent during the survey team's working hours, drivers who were not consent to the study and drivers who were not complete the entire questionnaire.

2.2. Sampling

Sample size

The sample size was 335 drivers, and it was calculated using the SCHWARTZ formula adjusted for population size, with 95% confidence interval (95% CI) and a maximum variability of 50% [9]:

$$n = \frac{N}{1 + N \times e^2} \tag{1}$$

where

- n is the sample size.
- N is the total number of professional oil tanker drivers in BF.
- e is the level of precision used, which is ±5%.

Sampling technique

Non-probability sampling was used, comprising exhaustive recruitment of all drivers who were present during the survey period up to the desired sample size.

2.3. Data Collection Technique and Tools

The data were collected at the national hydrocarbon company's fuel depot. All transporters under contract to import on behalf of the national hydrocarbons company and all transporters supplying the country's fuel stations pass through the national hydrocarbons company's fuel depot, some to unload imported fuel and others to obtain supplies to meet the needs of the country's fuel stations.

The data collection team consisted of three investigators, including two occupational physicians. Data collection took place Monday to Friday from 7.30 am to 4 pm, with a break from 12.30 pm to 1.30 pm.

Data were collected using a self-reported questionnaire that preserves anonymity. This questionnaire was designed using scales commonly used to assess sleep quality, sleep disorders and sleep apnoea (Pittsburg Sleep Quality Index, Insomnia Severity Index, Pichot Fatigue Scale, Epworth Daytime Sleepiness Scale and Stop Bang questionnaire). A pre-test was carried out with around twenty drivers to make the necessary adjustments before collection. Each interviewed individual had his weight and length systematically measured. The questionnaire was explained in the national language to drivers who had difficulty understanding it. The questionnaire that preserves anonymity included sociodemographic data, life history, habits, working condition information, sleep habits, signs of fatigue while driving, sleep quality, insomnia, daytime sleepiness, sleep apnoea and signs of restless legs syndrome.

2.4. Operational Aspects of the Variables

Data of the following variables were collected:

Dependent variables

Sleep disorders relating to

- Sleep quality, assessed using the PITTSBURGH Sleep Quality Index (PSQI).
- Insomnia, assessed with Insomnia Severity Index (ISI).
- Sleep apnoea syndrome, assessed using the PICHOT Fatigue Scale, the EPWORTH Daytime Sleepiness Scale and the STOP-BANG Questionnaire.
- Restless legs syndrome assessed by examination.

Independent variables

- Socio-demographic characteristics.
- History and lifestyle habits.
- Working conditions.
- Clinical data.

2.5. Operational Definitions of the Variables

PITTSBURGH Sleep Quality Index

The PSQI questionnaire is used to assess sleep quality during the past month; it consists of 19 self-assessment questions that yield an overall score based on seven "components":

- Subjective sleep quality, which is rated as very good, fairly good, fairly bad or very bad.
- Sleep latency, which is rated as very poor, fairly poor, fairly good or very good.
- Sleep duration, which is subdivided into four sub-classes: more than 7 hours, between 6 and 7 hours, between 5 and 6 hours and less than 5 hours.
- Habitual sleep efficiency, which is subdivided into four sub-classes: less than 65%, between 65% and 74%, between 75% and 84% and greater than 85%.
- Sleep disturbance

Scores range from zero to 27, with zero meaning no sleep disturbance in the previous month and 19 to 27 meaning sleep disturbance three or more time a week.

- Use of a sleeping pill

This category was subdivided into four sub-classes: not in the last month; less than once a week; once or twice a week and three or four times a week.

- Disturbance of daytime functioning

This category includes the following sub-classes: very poor; fairly poor; fairly good and very good.

Each component was rated a score from 0 to 3. In all cases, a score of 0 indicated that there were no difficulties, while a score of 3 indicated the presence of severe difficulties. The seven components of the score were added together to yield an overall score ranging from 0 to 21 points. A total PSQI score greater than 5 indicated sleep disturbance and a score less than or equal to 5 indicated no sleep disturbance [10].

Insomnia Severity Index [11]

The ISI is a self-reported measurement instrument assessing the subjective symptoms and consequences of insomnia, as well as the degree of worry or distress caused by sleep difficulties. The ISI comprises seven items rated on a scale from 0 to 4, with a total score ranging from 0 to 28. Typically, the total ISI score was used to classify individuals according to the insomnia severity. Score between 0 and 7 indicates no insomnia, score between 8 and 14 indicates sub-clinical insomnia symptoms, score between 15 and 21 indicates moderate insomnia and score between 22 and 28 indicates severe insomnia.

PICHOT Fatigue Scale [12]

The PICHOT Fatigue Scale is used to detect pathological fatigue. Fatigue is assessed by how difficult it is for patients to return to their usual level of fitness and carry out their daily activities. Eight items were scored from 0 to 4. Thus, when score ≤ 22 indicates normal fatigue, and when score > 22 indicates excessive fatigue.

EPWORTH Daytime Sleepiness Scale [13]

This scale enables clinical assessment of daytime sleepiness. It is a self-administered questionnaire consisting of eight items whose answers are rated from 0 to 3 according to the probability of falling asleep in different situations. A score of 11 or higher indicated excessive daytime sleepiness. Thus, when score < 11 indicates no sleep debt, score between 11 and 15 indicates sleep debt and score ≥ 16 indicates signs of excessive daytime sleepiness.

STOP-BANG Questionnaire [14] [15]

This questionnaire was used to assess the risk of developing sleep apnoea syndrome. Two categories, namely, snoring and certain anthropometric parameters including body mass index, age, neck circumference and sex, are decisive in quantifying the risk of obstructive sleep apnoea (OSA) syndrome. The result is interpreted as follows: score between 5 and 8 indicates high risk, score between 3 and 4 indicates medium risk and score between 0 and 2 indicates low risk.

Restless legs syndrome [16] [17]

Diagnostic suspicion is based on the following signs: the need to move the legs accompanied to varying degrees by unpleasant sensations, predominantly during the evening and improved by movements.

Socio-demographic characteristics

– Age (years).
– Sex (male, female).
– Marital status (couple, single, divorced/widowed).
– Educational attainment (none, primary, secondary, superior).
– Occupational status (experience/duration in driving).

History and lifestyle habits

– Comorbidities: history of diabetes, history of arterial hypertension, overweight and obesity assessed by Body Mass Index value (Overweight if BMI [25 - 29.9] Kg/m^2 and Obesity if BMI > 29.9 kg/m^2).
– Lifestyle habits: alcohol consumption, tobacco consumption, coffee consumption, tea consumption, cola consumption, energy drink consumption, physical activity and use of bright screen in bed.

Clinical data

Weight, length and neck circumference.

Working condition

– Driving time per day (hours).
– Night driving.
– Regular weekly schedule.

- Distance travelled per day (kilometer).
- Road accident frequency.

2.6. Data Processing and Analysis

For the purpose of the study, in PSQI results, we defined subjective sleep quality into two sub-classes (good and bad) instead into four sub-classes (very good, fairly good, fairly bad or very bad) and sleep duration into two sub-classes (less than seven hours and more or equal to seven hours) instead into four sub-classes (more than 7 hours, between 6 and 7 hours, between 5 and 6 hours and less than 5 hours).

Data were analysed using R 3.6.1 software. Distribution tables were generated. Proportions, means and measures of dispersion were computed. The first part of data analysis involved using the parameters of central tendency, dispersion and 95% CI to describe the study population. The second part of the analysis involved a univariate analysis. In this analysis, we assessed the association between the dependent variable and the independent variables by performing a simple logistic regression for each variable. Proportion comparison tests were performed using Pearson's chi-square test, and if this test was invalid, then Fisher's two-tailed exact test.

A multivariate logistic regression analysis was conducted to identify associated factors. All variables with a p-value of less than 0.20 in the univariate analysis were retained for logistic regression analysis. A study of the independence between the evaluated factors was conducted, as well as the interaction terms. Variables for the final model were selected using a top-down stepwise regression procedure. The contribution of each variable to the model was estimated using the likelihood ratio test. The contribution of an independent variable to the dependent variable was significant at the 0.05 level. Adjusted odds ratios (ORs) with their 95% CIs were calculated.

2.7. Ethical Considerations

This study was approved by the Ethics Committee for Health Research (CERS) in BF (No. 2020-3-057). Drivers were informed of the study objectives and of their right to refuse or participate in the study. Their informed consent was obtained, and their anonymity was respected. Drivers with sleep disorders were referred to specialists.

3. Results

All drivers waiting to load or unload their tankers agreed to take part in the study. A total of 339 drivers participated in the study.

3.1. Socio-Demographic and Occupational Characteristics

All the drivers surveyed were male, and the average age was 37 ± 9 years (range: 20 - 72 years). Table 1 presents the socio-demographic and occupational data.

Table 1. Distribution of drivers by socio-demographic and occupational characteristics (n = 339).

	Number	Percentage
Ages (years)		
20 - 30	84	24.8
31 - 36	84	24.8
37 - 41	82	24.2
≥42	89	26.2
Sex		
Male	339	100
Female	00	00
Marital status		
Couple	266	78.5
Single	60	17.7
Divorced/widowed	13	3.8
Educational attainment		
None	114	33.6
Primary	128	37.8
Secondary	97	28.6
Experience/duration in driving (years)		
0 - 9	222	65.5
10 - 19	85	25
20 - 29	27	08
≥30	5	1.5

3.2. Comorbidities and Lifestyle

Our study revealed that 39.2% of drivers regularly consumed alcohol, 78.5% regularly drank coffee, 62.2% were smokers and 27.1% practised regular physical activity. Table 2 presents drivers' lifestyles.

3.3. Working Situation

The average driving time for drivers was 10 ± 5 hours per day (range: 2 - 24 hours per day). Among the respondents, 42.5% drove at night. None of the drivers had a fixed, regular weekly schedule, and their driving times and journeys varied from day to day. Drivers drove an average distance of 457.88 ± 262.07 km per day. The minimum distance travelled per day was 100 km, and the maximum was 1100 km. Among all drivers, 57 (16.8%) stated that they had experienced at least one accident while driving since they took up this profession, 26 (7.7%) blamed fatigue as the cause of the accident, 22 (6.5%) stated that reduced alertness was the cause and 13 (3.8%) stated that drowsiness while driving was the cause.

Table 2. Distribution of drivers by comorbidities and lifestyle (n = 339).

	Number	Percentage
Comorbidities		
Diabetes mellitus	23	6.8
Arterial hypertension	25	7.4
Overweight and obesity		
BMI[a] ≥ 25 kg/m^2	196	57.8
Overweight	144	42.5
Obesity	52	15.3
Neck circumference ≥ 40 cm[b]	41	12.1
Lifestyle		
Alcohol consumer	133	39.2
Tobacco smoker	211	62.2
<20 cigarettes per day	135	64.0
≥20 cigarettes per day	76	36.0
Coffee consumer	266	78.5
≤3 cups per day	197	74.1
>3 cups per day	69	25.9
Tea consumer	111	32.7
≤3 cups per day	101	91.0
>3 cups per day	10	9.0
Cola consumer	50	14.7
Energy drink consumer	136	40.1
Regular physical activity	92	27.1
Use of bright screen in bed	66	19.5

a. BMI, Body Mass Index; b. cm, centimetre.

3.4. Sleep Quality

The average time of sleep per day was 5.9 ± 1.6 hours (range: 2 - 11 hours).

According to the PSQI, 198 drivers (58.4%) had a sleep duration of less than 7 hours. A proportion of 25.4% of drivers claimed to have bad sleep quality (bad and very bad) and 74.6% good sleep quality (good and very good). An overall PSQI score of more than 5 was found in 52.2% of drivers. The distribution of drivers according to the PSQI is shown in Table 3.

3.5. Insomnia

Our study revealed that 114 (33.6%) drivers experienced insomnia. Insomnia occurred at midnight in 68 (20.1%) drivers, insomnia while falling asleep in 25 (7.4%) drivers, and insomnia during early morning awakening in 53 (15.6%) drivers. The median score for the ISI among the drivers was 2, with an interquartile range of 0 to 10. The distribution of drivers according to ISI score showed

Table 3. Distribution of drivers according to the PSQI (n = 339).

	Number	percentage
Subjective quality of sleep		
Bad	86	25.4
Good	253	74.6
Sleep latency		
Very bad	33	9.7
Bad-enough	36	10.6
Good enough	99	29.2
Very good	171	50.4
Sleep duration (in hours)		
<7	198	58.4
≥7	141	41.6
Usual sleep efficiency (%)		
<65	3	0.9
65 - 74	0	0.0
75 - 84	10	2.9
>85	326	96.2
Sleep disturbance		
<1	25	7.4
2 - 9	305	90.4
10 - 18	9	2.7
Use of a sleeping pill		
Not in the last month	304	89.6
Less than once a week	25	7.4
1 or 2 times a week	9	2.7
3 or 4 times a week	1	0.3
Disruption of daytime operation		
Very bad	3	0.9
Enough-bad	28	8.3
Good enough	100	29.5
Very good	208	61.4
PITTSBURGH Sleep Quality Index score		
≤5	162	47.8
>5	177	52.2

no insomnia (scores 0 to 7) for 225 (66.4%) drivers, sub-clinical insomnia (score 8 to 14) for 71 (20.9%) drivers, moderate insomnia (score 15 to 21) for 41 (12.1%) drivers and severe insomnia (score over 21) for 2 (0.6%) drivers.

Of the insomniac drivers, 22.4% (n = 76) stated that insomnia affected the drivers' daytime performance. According to the drivers, the effects of insomnia were accidents while driving in four (1.2%) drivers, reduced attention or concentration in 38 (11.2%) drivers, fatigue or poor form in 69 (20.4%) drivers, mood instability or irritability in 33 (9.7%) drivers, memory problems in six (1.8%) drivers, and headaches in 33 (9.7%) drivers.

3.6. Sleep Apnoea Syndrome

The signs of fatigue reported by the drivers were dominated by tingling eyes (24.8%), difficulty keeping the eyelids open (22.4%), the need to scratch the head or massage the back of the neck (19.5%), coordination errors (18.9%), repeated yawning (16.8%) and staring into space (13.9%).

Assessment of fatigue using the PICHOT Fatigue Scale showed that 8.8% of drivers were excessively tired.

The STOP-BANG questionnaire revealed that 4.7% of drivers were at high risk of developing sleep apnoea.

The distribution of drivers according to the risk of sleep apnoea based on the STOP-BANG questionnaire showed that 276 (81.4%) had a low risk of sleep apnoea, 47 (13.9%) had a moderate risk and 16 (4.7%) had a high risk.

Assessment of sleepiness using the Epworth scale revealed that 90 (26.6%) drivers had a sleep debt, 14 (4.1%) had excessive daytime sleepiness and 235 (69.3%) had no sleep debt.

3.7. Sleep Disorders Linked to Abnormal Movements

Overall, 136 (40.1%) drivers had no manifestation that could lead to suspicion of restless legs syndrome, 76 (22.4%) had manifestation that led to little suspicion, 61 (18%) had a moderate level of suspicion and 45 (13.6%) had a great deal of suspicion. A very high level of clinical suspicion was found in 20 (5.9%) respondents, who complained of an unpleasant tingling or burning sensation or discomfort with an urgent need to move their legs at rest, which made it difficult for them to fall asleep or woke them up at night with a strong desire to move them, excluding cramps. These sensations were transiently improved by movement, exacerbated at rest, and worsened during night.

3.8. Risk Factors Associated with Sleep Disorders

Risk factors associated with insomnia: univariate analysis

Socio-demographic and occupational factors.

Our findings did not reveal a significant link between socio-demographic and socio-professional factors and insomnia.

Lifestyle factors

Tobacco use, alcohol consumption and coffee intake were factors associated with insomnia development in the univariate analysis. Table 4 lists factors associated with insomnia development in relation to lifestyle factors in the univariate analysis.

Table 4. Risk factors associated with insomnia in relation to lifestyle among drivers in univariate analysis. (n = 339).

	All	Insomnia		Orb[a] (95% CI[b])	p-value
		Yes (%)	No (%)		
Tobacco smoker					0.014
No	128	9 (7.0)	119 (93.0)	1	
Yes	211	34 (16.1)	177 (83.9)	2.54 (1.18 - 5.49)	
Coffee consumer					0.049
No	70	4 (5.7)	66 (94.3)	1	
Yes	269	39 (14.5)	230 (85.5)	2.80 (0.96 - 8.11)	
Tea consumer					0.469
No	228	31 (13.6)	197 (86.4)	1	
Yes	111	12 (10.8)	99 (89.2)	0.77 (0.38 - 1.56)	
Alcohol consumer					0.040
No	206	20 (9.7)	186 (90.3)	1	
Yes	133	23 (17.3)	110 (82.7)	1.94 (1.02 - 3.70)	
Energy drink consumer					0.113
No	203	21 (10.3)	182 (89.7)	1	
Yes	136	22 (16.2)	114 (83.8)	1.67 (0.88 - 3.18)	
Regular physical activity					0.164
Yes	93	8 (8.6)	85 (91.4)	1	
No	246	35 (14.2)	211 (85.8)	1.76 (0.79 - 3.96)	

a. Odds ratio brut; b. Confidence interval.

Other sleep disorders associated with insomnia

Our study revealed that daytime sleepiness, suspected restless legs syndrome and daytime fatigue were factors associated with insomnia in the univariate analysis. Table 5 presents other sleep disorders associated with insomnia.

3.9. Risk Factors Associated with Suspected Sleep Apnoea Syndrome: Multivariate Analysis

In our study, the risk factors associated with sleep apnoea syndrome were a history of diabetes ($p < 0.001$) and insomnia ($p < 0.001$). Risk factors associated with SAS are shown in Table 6.

4. Discussion

4.1. Socio-Demographic Characteristics

All the respondents in the present study were male. Work segregation by gender is observed in several areas [18]. In our context, professional driving is traditionally seen as a man's job. This seems to be linked to the various constraints that the job requires. Other reasons, of a historical and social nature, can be put

Table 5. Sleep disorders associated with insomnia among drivers in univariate analysis.

	All	Insomnia Yes (%)	Insomnia No (%)	OR[a] (95% CI[b])	p-value
EPWORTH Daytime Sleepiness					<0.001
No sleep debt	235	9 (3.8)	226 (96.2)	1	
Sleep deficit	90	30 (33.3)	60 (66.7)	12.56 (5.66 - 27.87)	
Excessive daytime sleepiness	14	4 (28.6)	10 (71.4)	10.04 (2.64 - 38.26)	
Suspicion of restless legs syndrome					<0.001
No	136	4 (2.9)	132 (97.1)	1	
Yes	203	39 (19.2)	164 (80.8)	7.85 (2.73 - 22.36)	
Daytime fatigue					<0.001
No	309	33 (10.7)	276 (89.3)	1	
Yes	30	10 (33.3)	20 (66.7)	4.18 (1.80 - 9.69)	
Risk of sleep apnoea syndrome					0.399
No	276	33 (12.0)	243 (88.0)	1	
Yes	63	10 (15.9)	53 (84.1)	1.39 (0.64 - 2.99)	

a. Odds ratio, b. Confidence interval.

Table 6. Risk factors associated with SAS among drivers in multivariate analysis.

		Risk of SAS[a]		Complete model		Minimised model	
		Yes (%)	No (%)	OR^{b}_{brut} (95% CI)	p-value	$OR_{adjusted}$ (95% CI[c])	p-value
History of diabetes					<0.001		<0.001
No	316	49 (15.5)	267 (84.5)	1		1	
Yes	23	14 (60.9)	9 (39.1)	8.48 (3.48 - 20.66)		8.9 (3.40 - 23.73)	
Tobacco smoker					0.727		-
No	128	25 (19.5)	103 (80.5)	1		-	
Yes	211	38 (18.0)	173 (82.0)	0.90 (0.52 - 1.59)		-	
Coffee consumer					0.488		-
No	70	11 (15.7)	59 (84.3)	1		-	
Yes	269	52 (19.3)	217 (80.7)	1.29 (0.63 - 2.62)		-	
Alcohol consumer					0.623		-
No	206	40 (19.4)	166 (80.6)	1		-	
Yes	133	23 (17.3)	110 (82.7)	0.87 (0.49 - 1.53)		-	
Insomnia severity index					0.0002		<0.001
Absence of insomnia	225	29 (12.9)	196 (87.1)	1		1	
Symptoms of insomnia	71	24 (33.8)	47 (66.2)	2.05 (0.91 - 4.59)		3.87 (1.92 - 7.79)	
Moderate/severe insomnia	43	10 (23.3)	33 (76.7)	3.45 (1.84 - 6.46)		2.19 (0.91 - 5.28)	

a. Sleep apnoea syndrome; b. Odds ratio; c. Confidence interval.

forward: the weight of tradition, importance of family and school conditioning from childhood and constraints of travel and working hours. However, the cultural and social changes observed in the 21st century could change this trend.

The average age of the drivers who participated in this study was 37 ± 9 years (range: 20 - 72 years), consistent with the literature findings. A Malian study of professional drivers reported an average age of 37.9 ± 8.5 years [7]. In Turkey, Ozer and al reported an average age of 39.99 ± 10.85 for public transport drivers [19]. Laraqui and al reported an average age of 39.3 ± 7.7 years in a study of professional drivers in Morocco [6]. Similarly, Ghézini and al reported an average age of 42.3 ± 9.8 years in a study of professional drivers in Algeria [20]. Although most drivers (65.5%) were employed for less than 10 years, only 24.8% were aged below 31 years. The relatively high average age in this job category could be related to the professional experience required by many employers and the lack of attractiveness of the job of a professional HGV driver.

As for educational level, our study revealed that 33.6% of drivers did not attend schooling and 37.8% had only primary education. No driver reached higher education level. The low level of education was observed by Diallo in Mali, who reported that 82% of road hauliers did not attend school [7]. Boro in Burkina revealed that 52.6% of professional interurban transport drivers did not attend school [21]. Laraqui and al in Morocco reported different findings, with only 15% of drivers not attending [22]. Such low levels of education in sub-Saharan Africa reflect the high rates of school drop-outs and non-enrolment in this part of Africa [23]. Thus, the need to find a job encourages on-the-job training as apprentice drivers and then drivers.

4.2. Comorbidities and Lifestyle Habits

In our study population, 57.8% of the drivers were overweight or obese. This proportion was higher than the 17.9% prevalence of overweight and obesity in the general population in BF in 2013 according to the STEPS survey [24]. Our findings corroborate those of Boro in BF, who reported an overweight and obesity prevalence of 59.8% among intercity public transport drivers [21]. The same finding was reported by Aguiar *et al.* in Algeria, who reported an overweight and obesity prevalence of 60.2% among professional lorry drivers [25]. In a study of sleep disorders among healthcare workers in Benin, Hinson *et al.* reported an overweight and obesity prevalence of 50.2% [26]. Our values are lower than those reported by Ghézini *et al.* in Algeria, who noted a prevalence of 62.3% [20]. The same finding was reported by Laraqui S and al in Morocco, who demonstrated an overweight and obesity prevalence of 62.2% in a study of professional drivers [6]. The high proportion of overweight and obese drivers is thought to be attributed to their lifestyle. Driving for several hours a day with atypical working hours, it is difficult for a professional driver to adhere to the usual mealtimes and engage in regular physical activity. Only 27.1% of our drivers indicated that they engage in regular physical activity. They also acknowledged their difficulties in eating a healthy, balanced and regular diet, as breaks could not often be utilized at predictable times. Meals were often reduced to snacks to appease hunger while driving and, above all, to avoid drowsiness while driving.

The prevalence rates of diabetes and arterial hypertension were 6.8% and 7.4%, respectively. Marwa *et al.* in Tunisia [27] and Thiese *et al.* in the USA [28] reported higher prevalences. The prevalences of diabetes and arterial hypertension in the BF were estimated at 7.6% and 18.2% respectively in 2021, higher than those in our study [29]. These differences may be due to the fact that in our study diabetes and hypertension were self-reported by drivers. In fact, more than 50 of diabetics in our regions and almost 50 of hypertensives worldwide are unaware of their status [30] [31].

Our study also revealed that 78.5% of drivers regularly drank coffee, 39.2% drank alcohol and 62.2% were smokers. Among the smokers, 37% consumed more than a packet of cigarettes a day. Several studies have reported similar results [20] [22] [25] [32]. This increased consumption of stimulants among drivers could be explained by the daily stress of their activity and also by their sedentary lifestyle and the need to stay awake while driving.

4.3. Working Situation

The average driving duration for our drivers was 10 ± 5 hours per day (range: 2 - 24 hours per day). Our findings corroborate those of Laraqui *et al.* in Morocco who reported an average daily working time of 10.6 ± 1.6 hours among professional drivers [6]. Diallo in Mali showed that 73.2% of the drivers surveyed worked for 11 - 14 hours [7]. Laraqui *et al.* in Casablanca showed that 50.3% of HGV drivers for worked more than 12 hours a day [33]. None of the drivers in our study had a fixed, regular weekly schedule, driving times and driving routes varied from day to day. Professional drivers often had atypical and highly variable working hours, working nights, weekends and shifts. As reported by Hedberg [34] these variable working hours are a major obstacle to the adoption of health-promoting behaviours.

4.4. Insomnia

Our study revealed that 33.6% of drivers had insomnia, 22.4% of whom stated that insomnia affected their daytime performance. In 20.4% of drivers, insomnia occurred in the form of fatigue and poor health, and in 11.2% of drivers, it was reduced attention and concentration. Our findings are comparable to those of Aguiar *et al.* in Algeria [25] and Laraqui *et al.* in Casablanca [33], who reported insomnia prevalence rates of 30.1% and 36.5%, respectively, among professional drivers. A lower prevalence (12.4%) was reported by Diallo in Bamako among professional lorry drivers [7]. Ghézini *et al.* in Algeria showed a higher prevalence of insomnia (50%) among professional drivers [20]. The same finding was reported by Hinson *et al.* in Benin, who assessed another registry and reported a insomnia prevalence of 66.8% among nursing staff [26]. Several lifestyle factors are associated with an increased risk of insomnia in the general population. A similar finding was reported for drivers who considered themselves to lead a stressful life and for shift and night workers. The disruption of the biological clock, as a result of the disrupted wake-up and bedtimes of professional drivers, is a risk factor for insomnia. Beck *et al.* [35] reported the desynchronisation of the biological clock with the rising and setting times as a risk factor, with the quality and quantity of sleep being dependent on the correct synchronisation of the biological clock with the rising and setting times.

4.5. Sleep Apnoea Syndrome

Our study reported a prevalence of SAS symptoms of 4.7% among drivers. Other studies reported prevalence rates similar to those in our study among professional interurban public transport drivers [21] [25]. However, our findings are lower than those of Ouédraogo *et al.* in BF who reported a prevalence of sleep apnoea symptoms of 9.6% [36]. Ghézini *et al.* in Algeria, reported a SAS prevalence of 10.2% among professional drivers [20]. The same finding was reported by Chaiard *et al.* in Thailand, who reported a SAS prevalence of approximately 18.1% [37]. Data reported in the literature indicated a SAS prevalence of 2% - 4% in the general population [38]. Daytime sleepiness is a symptom associated with a high prevalence in the general population. The wide variability in prevalence rates is partly explained by the methodological differences and shortcomings [39]. Sleepiness can be assessed subjectively using scales such as the Epworth scale. In our study, which used the Epworth scale, daytime sleepiness was reported in 30.7% of drivers. Similar results were reported by other authors [6] [25] [33]. Drivers often confuse this symptom with fatigue. It is therefore easy to understand the vital role played by screening for this symptom during consultations [40]. Vigilance must be the watchword when faced with a complaint of fatigue or a profile suggestive of drowsiness.

4.6. Factors Associated with Sleep Disorders

Our study revealed that smoking consumption, coffee intake and alcohol usage were risk factors for insomnia in univariate analysis ($p = 0.014$, $p = 0.049$ and $p = 0.040$, respectively). Data from several studies suggest that lifestyle, that is, sedentary lifestyle, use of stimulants, alcohol consumption, precarious situations and certain difficult life events are risk factors for insomnia [35] [41]. Factors favouring insomnia in professional drivers could be due to the abuse of stimulants, overwork, work-related stress, economic worries and night work and/or atypical working hours. A history of diabetes (OR = 8.98, 95% CI [3.40 - 23.73]) and insomnia (OR = 3.87, 95% CI [1.92 - 7.79]) were risk factors associated with SAS in our study. Our findings corroborate those of the literature. SAS is very often associated with elements of the metabolic syndrome, which should be systematically investigated. According to the literature data, 15% - 30% of patients with OSA have diabetes. Conversely, up to 70% of patients with diabetes have an associated OSA syndrome [42]. Meslier reported a 86% prevalence of OSA hypopnoea syndrome in patients with type 2 diabetes [43]. Borel *et al.* reported up to 40% prevalence of SAS among patients with type 1 diabetes [44]. Several authors reported an association between OSA and diabetes [45] [46]. Reutrakul and Mokhlesi also addressed the pathogenetic mechanisms involved in this association in their study of diabetes and OSA [47].

The probability of developing SAS was approximately four times higher in drivers with insomnia. In addition, nearly 30% - 50% of patients with nocturnal respiratory disorders experience insomnia. In addition, the assessment of patients with insomnia may also, quite frequently, reveal the presence of respiratory disturbances during sleep, as described by Bayon and Leger [48]. Hein *et al.* [49] also reported a 13.88% prevalence of moderate-to-severe OSA syndrome in patients with insomnia. Studies have shown a comorbidity between insomnia and OSA [49] [50]. Each of these pathologies (insomnia and OSA) has an effect on the other through pathophysiological mechanisms, which are not yet fully understood. This comorbidity complicates therapeutic management, which needs to be comprehensive. Thus, in case of insomnia, clinical signs suggestive of OSA should be sought and, even if there is the slightest doubt, polysomnography-based screening should be performed, and in the case of OSA, insomnia should be systematically assessed using the ISI.

This study has limitations related to the self-reported nature of the questionnaire, which may be the source of reporting bias with regard to medical history and the understanding of items, even though the interviewers explained the meaning of the questions, usually in local languages. Similarly, the absence of data from polysomnographic exploration could be a source of bias in the results.

5. Conclusion

This study revealed a 52.2% prevalence of sleep disturbance and a 33.6% prevalence of insomnia among drivers, with the use of psychostimulants as a risk factor. The prevalence of SAS was 4.7%, with diabetes and insomnia as associated factors. If the findings of this study are considered, then it should be possible to detect and treat sleep-disordered breathing in professional drivers at an early stage, as soon as they are hired, to reduce the morbidity and catastrophic costs of the risks associated with drowsiness while driving HGVs. A larger study involving the use of ventilatory polygraphy in professional drivers would be an asset in gaining a better understanding of sleep disorders in this profession.

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Conflicts of Interest

All authors declare no conflict of interest.

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